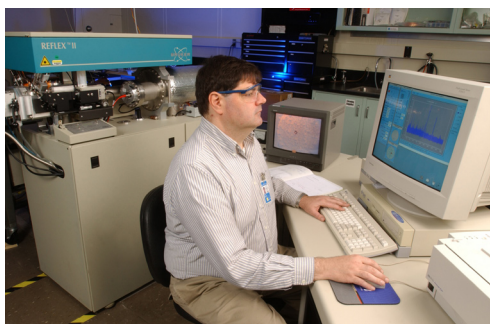


Measurement Facilities: *Macromolecular Mass Spectrometry*

Mass Spectrometry is used to measure the molecular mass distribution of synthetic polymers, as well as in studies of molecular architecture and chemical composition, especially of prepolymers and copolymers. MALDI-TOF-MS, Matrix Assisted Laser Desorption Ionization-Time of Flight-Mass Spectrometry uses laser light to ablate entire, unfragmented polymer molecules, from a target surface into a time-of-flight mass spectrometer. A UV-absorbing organic matrix is used to facilitate the ablation of intact polymer molecules.

Traditional MALDI

MSEL's Polymers Division facility has a high-resolution Bruker Reflex II time-of-flight mass spectrometer with the capability of mass measurements on synthetic polymers up to 250 ku. Isotope resolution may be obtained for polymers with masses less than 5 ku. Polymers of larger mass, depending on the repeat mass of the polymer, may be resolved at the repeat mass level. For example, polystyrenes with masses less than 40 ku, can be resolved by repeat units. As a consequence, copolymer compositions or end group distributions may be obtained as a function of molecular mass for polymers with total mass below 40 ku. At low masses, studies may be made of polymer architecture and how it is affected by chemical synthesis.



MALDI-TOF Mass Spectrometer

Heated MALDI

Adding to the MALDI-TOF capabilities described above, the facility also houses a one-of-kind MALDI-TOF instrument. The instrument is a Comstock/Atom Sciences model RTOF-260 reflectron time-of-flight (TOF) instrument.

Some unique aspects of the instrument are:

- The sample is held at ground potential during laser ablation.
- The ion source and entrance to the TOF mass separator, originally designed for gas-phase ionization experiments, have a large ionization volume and wide acceptance angle, respectively.
- The copper sample stage is capable of resistive heating to 250 °C.
- An Nd:YAG laser has been added to improve ablation intensity and stability.



Heated MALDI-TOF Mass Spectrometer

Gas Chromatography-Mass Spectrometer

The Polymers Division has also recently rounded out its mass spectrometry capabilities by purchasing a gas chromatography-mass spectrometer (GC-MS) for trace component analyses.



Thermo/Finnegan GC-MS

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